ADLINK
Leading EDGE COMPUTING

Application Story

Battlespace Communications System with COM Express Type 7 Module

Enables faster data transfer in a rugged, compact platform



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Challenges from defense aeronautics applications of network communications systems

As technology moves forward at a rapid pace, national defense and aeronautical modular systems have also expanded in functionality while system volume has been reduced. The goal is to provide a solution that can improve performance and keep a tight volume, and in that way, allow the Battlespace Communications System solution to adapt to limits in space. This goal has been placed relatively high on the agenda for the national defense network strategy.

In addition to expanding system functions are requirements for high bandwidth transfers and signal management systems such as wide area augmentation system (WAAS), radar, drones/unmanned aerial vehicles, and others. All of these technologies have extremely stringent requirements on delays in transmission. That is why suppliers strive to maintain highly effective solutions but within reasonable power consumption ranges. And precisely because it is used with defense and aeronautics applications, this headless computer[1] often requires a longer product lifespan. Careful material selection and planning is required to ensure that supply and maintenance are without fault; this applies not only to the CPU and storage cards but also to interfaces.

ADLINK is helping a worldwide leading aerospace enterprises to transform the original Battlespace Communications System into one that incorporates digital strategic communications system specifications. The Battlespace Communications System is used for the wired and wireless infrastructure of army divisions and command centers; it provides stable bandwidth for data, audio, and video transmission. The COM Express Type 7 module, paired with an efficient CPU and sufficient bandwidth, can handle massive movements of data in the toughest environments. This smaller footprint means a lighter design, which is optimal for land defense - and an ideal choice for itself.

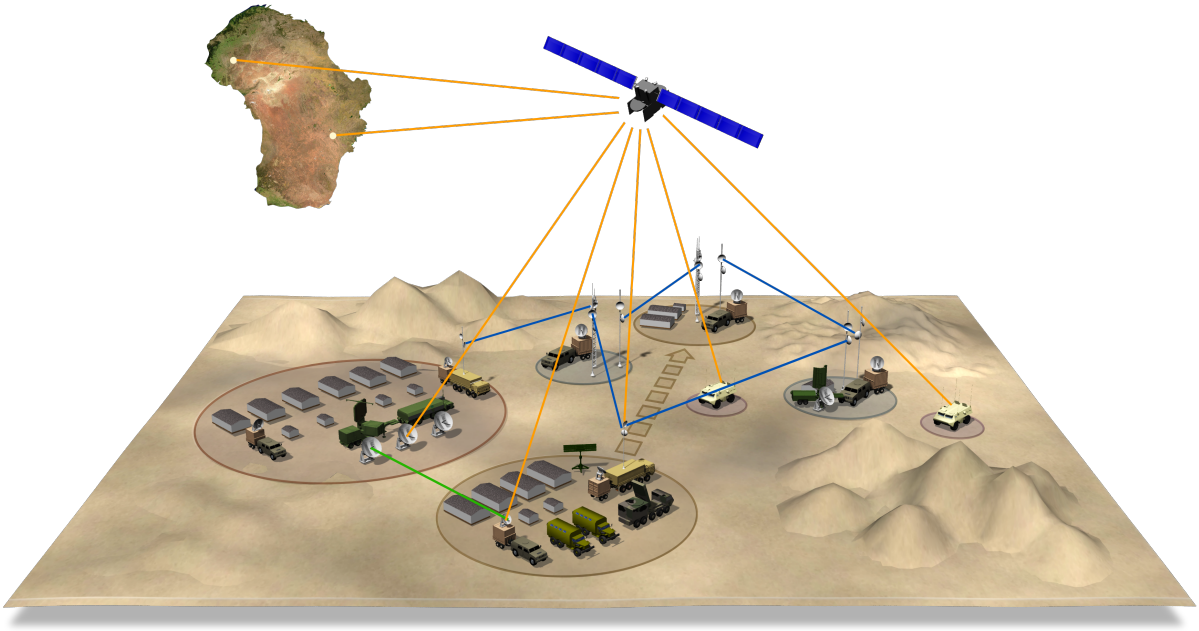


Figure 1: Battlefield Communications System situation map

Professional technology consultant services

During the development of the product, the client picked two solutions for a comparison: a rugged server available on the market and the ADLINK Com Express Type 7 module. The results were enlightening. While rugged, the server just could not beat the diversity of the COM Express Type 7 module setup featuring USB 3.0, a multi-combo expansion bus, and an I^2C bus. Clients can also set up a system with the COM Express Type 7 module as a base on a customized configuration. This gives clients a more sensitive, more flexible solution, and one that is more in line with application requirements than the ready-made rugged servers on the market. When there are new application requirements, all the client needs to do is update the I/O configuration and make some small modifications on the motherboard. This garners more bids from customers because of the huge increases in upgrade turnaround speed.



Figure 2: COM Express Type 7 interfaces

[1] Reference: https://en.wikipedia.org/wiki/Headless_computer

ADLINK is an important member of PICMG® (PCI Industrial Computer Manufacturers Group), defining the pin signals of the COM Express Type 7; it is also an premier member of Intel® IoT Solutions Alliance. ADLINK provides more easily expandable solutions and more interoperability for both modular components and market-ready systems (MRS). ADLINK also provides samples in advance and add-on Highly Accelerated Life Testing (HALT) and benchmark testing full reports for reference. In the end, what customer chose for their Battlespace Communications System solution was the COM Express Type 7 module paired with their self-developed system case.

After looking at the specifications, the customer chose the Xeon-D1539 (12-core) processor. ADLINK then carried out sample heat testing verification and reliability tests with these specifications. The customer then can use that real-world test data to carry out MIL-STD tests with the processor and system. ADLINK provides real-time tech support to ensure that the customer's needs are put first, and that the customer can depend on ADLINK as a trustworthy partner.

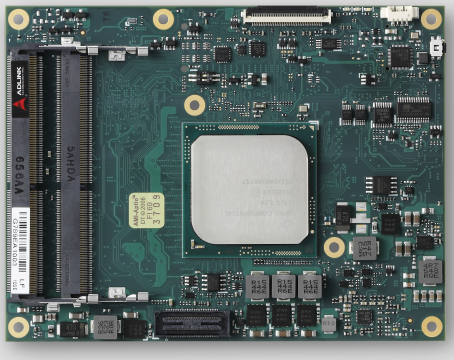


Figure 3: COM Express Type 7 module: Express-BD7

Express-BD7

COM Express Basic Size Type 7 Module with Up to 16 Cores Intel® Xeon® D-1500 Series and Pentium® D SoC (formerly: Broadwell-DE)

- Up to 32GB dual channel DDR4 SDRAM at 1867/2133/2400MHz (ECC for selected skus)
- Two 10G Ethernet and NC-SI support
- Up to eight PCIe x1 (Gen2), one PCIe x16 (Gen3)
- GbE, two SATA 6 Gb/s, four USB 3.0/2.0
- Supports Smart Embedded Management Agent (SEMA®) functions
- Extreme rugged operating temperature: -40°C to +85°C (selected skus)

Modular configuration and expandability allows for flexible battle deployment strategy

Armed forces must be able to deploy swiftly into potentially hazardous environments. That means that portability of equipment and modular design is crucial for success in the fray. The basic dimensions of the COM Express Type 7 are 125mm x 95mm. Even if a baseplate is added, it still can be easily embedded into a server that is also modularly designed. In the Tactical Services Router, the customer uses COM Express' standard definition and its unique characteristics, like expandability, along with a rugged general-use server and router.

A COM Express module can connect to all sensors and can provide different resource distribution and planning from the operating system, commander, field personnel, army, navy, and air force, to massively increase system sensitivity and execute highly flexible deployment missions. It can also effectively control and increase Quality of Service, (QoS) to satisfy end-to-end network high-efficiency operational requirements. For example: Express-BD7 is installed with Intel® Xeon® CPU for support of 2 sets of 10G Ethernet (10GBASE-KR) and a PCIe interface external display card, which gives high connectivity and expandability to carry out dense broadband applications. Even when multiple devices are transferring large amounts of data, speed and stability are not affected; with obvious advantages in 3D drawing and mapping of the battlefield environment and terrain, the equipment can help the team to make decisions and respond with speed and precision.

The optimal balance between power consumption, stability, and massive data streaming

A Battlespace Communications System based on a COM Express Type 7 module gives a perfect balance of power consumption and efficiency with a built-in maximum thermal design power (TDP) System on a Chip (SoC) lower than 65W. For example, 10 units of COM Express-BD7 with a 16-core Intel® Xeon® D processor each consume about 25-45W. A total of 160 cores can support a maximum computing power of 0.4 terabytes/second (Tbps). Compared to a 1U standard height server, power consumption is down 25% to 50%.

Compared to the Type 6 lead, the Type 7 ditched all audio/video support for 4 10-GbE connection ports. In other words, one Type 7 module has up to 32 PCI Express (PCIe) ports. These designs, made specifically for network connections, increase application efficiency of network communications systems. Also worth mentioning is that although the COM Express Type 7 is designed to provide a modular server that can massively process data streaming, and so cannot support audio video specifications, a display card can still use the PCIe external interface to solve image application requirements.

Designed for hostile environments

COM Express modules need to be readymade for tough environments. In such a case, a specific module is selected, a thermal design that deviates from the norm. The module then passes the Highly Accelerated Life Test (HALT) and other verification tests. Thermal designs support standard 12V/5V and 8.5V-20V voltage widths, allowing the module to operate in temperatures as low as -85 . The module passes durable impact and vibration IEC-60068-2-64 and IEC 60068-2-27 standards, as well as the MIL-STD-202F environmental tests (Method 213B, Table 213-1, Condition A and Method 214A, Table 214-1, Condition D). At the same time, the COM Express module completes testing for signal integrity (SI) and power sequence.



On top of all this, the vertical market of the national defense application has very stringent after-sales service requirements. ADLINK uses Product Lifecycle Management (PLM) to strictly ensure quality for the components and the end product. ADLINK guarantees a more than 10-year product lifecycle, including coverages for maintenance, repairs, and operation, and components and processors are readily available, thus making ADLINK the ideal solution provider for defense aeronautics.

About ADLINK

ADLINK Technology is a global leader in Edge Computing. Our mission is to facilitate the use of advanced technologies to help optimize the business performance of our customers. We provide robust boards, platforms and user interfaces; real-time data connectivity solutions; and application enablement for state-of-the-art industrial computing (e.g., machine learning via AI-at-the-Edge). Together, these also enable innovative end-to-end IoT solutions in support of operational excellence or new revenue streams. ADLINK serves customers in many vertical markets including: manufacturing, networking and communications, healthcare, infotainment, retail, energy, transportation, and government and defense.

ADLINK has an excellent eco-system of technology partners; we are a Premier Member of the Intel® Internet of Things Solutions Alliance, a strategic embedded partner of NVIDIA, and a valued thought-leader and contributor in many standards and interoperability initiatives, including Eclipse, ETSI, OCP, OMG, OpenFog, PICMG, ROS-I and SGeT.

ADLINK's products are available in over 40 countries, either directly or through our worldwide network of value-adding distributors and systems integrators. ADLINK is ISO-9001, ISO-14001, ISO-13485 and TL9000 certified and is publicly-traded on TAIEX (Stock Code: 6166).

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